I have read the paper "Quantum Physics and the Identity of Indiscernibles" by Michael Redhead and Steven French which you sent me. I think the paper is very interesting and should clearly be published. I do have some comments which you might waht to pass on to the authors.

p1. Neither events nor spacetime points would count as "physical individuals" according to the terminology adopted. Though permissible, this strikes me as a little unnatural.

There are use/mention confusions following equation (1). 'a' and 'b' are the individual constants, and 'F' a variable.

p2. Following equation (2), I think the authors mean intensional contexts, not intentional contexts.

It seems confusing to call a relation a non-monadic predicate (rather than property). Isn't a predicate a conceptual or linguistic item we use to (try to) pick out some property in the world?

I would prefer to say that in a relational theory of space a circularity threatens: it may be avoidable, at least in certain circumstances. Provided the world is sufficiently asymmetrical, it may be that each object always bears a set of qualitative spatial relations to all other objects which it shares with no other object.

p3. Even without TI, spatiotemporal continuity may require supplementation by continuity of other attributes in order to yield criteria for individuation and reidentification, at least if individuals can overlap spatially.

What is an 'intrinsic property'? I assume it is a property which is independent of spatial location. But this should be made clear.

p7. Surely the requirement $P|\varphi\rangle = \pm|\varphi\rangle$ can be met by assigning each permutation either + or - independently of the transpositions that compose it--in which case the

requirement could be satisfied by particles which were neither bosons nor fermions? e.g. $P_{123}=P_{213}=P_{321}=P_{312}=+1$, $P_{132}=P_{231}=-1$. I think that such a possibility can only be eliminated by imposing a <u>further</u>, independent indistinguishability requirement: that the result of any permutation depends only on <u>how many</u> particles are permuted, and not on which particular particles these are.

p8. One might argue that Q_1 and Q_2 simply fail to express any physical attributes, and that it is only symmetric combinations which do.

One general comment--
It seems to me that one will only accept (9) as the relevant notion of indiscernibility for the application of PII in quantum mechanics on certain assumptions. If one is a verificationist, then one will accept (9) on the grounds that when it holds, QM assures us that there is no way of distinguishing the relevant particles: but in that case, there is no motivation for considering unobservable "observables" like $Q_1 \otimes I$. If one is not a verificationist, then some other motivation for accepting (9) is required. But what could that be? I suggest that it has to rest on the assumption that the actual state of a system of particles is wholly specified by the set of expectation values of all observables on that system. If so, then <u>a fortiori</u> the quantum state of any system of particles must wholly specify its actual state. But this completeness assumption only holds on certain interpretations of quantum mechanics. It does not hold on the kind of hidden variable reconstruction mentioned on page 11. And it may not even hold on Bohr's interpretation. For I take it that, according to Bohr, a system of particles can only be attributed an actual state of its own in the context of a well-defined experimental arrangement. Even in such a well-defined experimental arrangement, the <u>quantum state</u> will not describe the actual state of a single system of particles: the quantum state is rather an instrument permitting statistical predictions concerning the results of measurements on an ensemble of similar systems. Each of the systems may be ascribed its own actual state depending on the result of the measurement on it, differing from one member to another. (e.g. in the Stern-Gerlach experiment performed on an ensemble described by a superposed state, each silver atom may be said to be in one beam or another, provided its presence is actually registered.) This raises the worry that even when (9) holds for a system of particles, the particles in that system may not in fact be indiscernible, even though no observation can distinguish them.